B.Sc. MATHEMATICS PROGRAMME

SYLLABUS

2009-2010 onwards

PONDICHERRY UNIVERSITY

PUDUCHERRY – 605 014

B.Sc. MATHEMATICS PROGRAMME

Regulations

Eligibility for admission:

A candidate for admission into B.Sc. programme shall have passed HSC (Plus Two) with Mathematics as a subject of study.

Duration of study:

The course duration shall normally be of three years spread over six semesters. The maximum duration to complete the course shall be 6 years.

Medium:

The medium of instruction shall be English.

Passing minimum:

40% of marks in each paper.

Conditions for Affiliation:

The following are the requirements for the grant of affiliation for B.Sc. Mathematics programme in the institutions affiliated to Pondicherry University:

(i) Faculty strength for B.Sc. Mathematics programme: 2 regular faculty in the first year.
Additional 2 regular faculty in the second year.
Additional 4 regular faculty in the third year.
A total of 8 regular faculty for the whole programme.

(ii) Qualifications for the faculty: The faculty shall possess the qualifications as prescribed by UGC.

(iii) Recruitment of faculty: The recruitment of faculty shall be through a duly constituted Selection Committee with a nominee of the University, by advertisement

(iv) Class rooms: 3 permanent rooms with furniture, platform and black board.
(v) Faculty room: 1 permanent room with furniture.
(vi) Computers: 4 for the faculty.
(vii) Library:
Books: 15 copies of each prescribed text book;
1 copy of each prescribed reference book.
(viii) Computer Lab facilities are required for the computer papers with 1 computer for every 2 students

SYLLABUS

1. This syllabus is effective for the candidates admitted from the Academic year 2009 – 2010 onwards.
2. The syllabus will be common for all the affiliated institutions offering B.Sc. Mathematics programme.
3. Semester System will be followed for all the affiliated institutions.

COURSE PATTERN FOR B.Sc. MATHEMATICS MAIN

FIRST SEMESTER:

1. ALGEBRA AND TRIGONOMETRY -I
2. CALCULUS –I
3. VECTOR ANALYSIS AND GEOMETRY – I

SECOND SEMESTER:

1. ALGEBRA AND TRIGONOMETRY –II
2. CALCULUS –II
3. VECTOR ANALYSIS AND GEOMETRY – II

THIRD SEMESTER:

1. ADVANCED CALCULUS
2. REAL ANALYSIS-I
3. STATISTICS-I

FOURTH SEMESTER:

1. THEORY OF NUMBERS, MULTIPLE INTEGRALS AND FOURIER TRANSFORM
2. REAL ANALYSIS-II
3. STATISTICS-II

FIFTH SEMESTER:

1. ABSTRACT ALGEBRA
2. COMPLEX ANALYSIS – I
3. MECHANICS – I: STATICS
4. OPERATIONS RESEARCH – I
5. PROGRAMMING IN C

SIXTH SEMESTER:

1. DISCRETE MATHEMATICS
2. COMPLEX ANALYSIS – II
3. MECHANICS – II: DYNAMICS
4. OPERATIONS RESEARCH – II
5. NUMERICAL ANALYSIS USING C

Semester - I

Paper - I **B111 NR**

BMG 101 – a ALGEBRA AND TRIGONOMETRY - I

Symmetric, skew symmetric, Hermitian and skew-Hermitian matrices. Elementary operations on matrices. Inverse of a matrix. Linear independence of row and column matrices. Row rank, column rank and rank of a matrix. Equivalence of column and row ranks. Eigen values, eigenvectors and the characteristic equation of a matrix. Cayley Hamilton theorem and its use in finding the inverse of a matrix. Applications of matrices to a system of linear equations. Theorems of consistency of a system of linear equations.

Relations between the roots and coefficients of a general polynomial equation in one variable. Transformation of equations. Descarte's rule of signs. Solution of cubic equations. Biquadratic equations.

De Moivre's Theorem and its applications. Direct and inverse circular and hyperbolic functions.

Reference books:

1. I.N.Herstein, Topics in algebra. Wiley Eastern Ltd, New Delhi, 1975.
2. T.K.Manicavachagom Pillay, T.Natarajan and K.S.Ganapathy, Algebra Volume - 1, S.Viswanathan (Printers & Publishers) Pvt. Ltd, 1999.
3. S.Narayanan and T.K.Manicavachagom Pillai, Trigonometry, S.Viswanathan (Printers & Publishers) Pvt. Ltd, 1997.
4. T.K.Manicavachagom Pillai, Matrices.

Note: TEN questions are to be set and Three – Fifths of the paper carries full marks.

Semester – I

Paper – II **B112 NR**

BMG 102 - a CALCULUS –I

Differential Calculus:

Є- δ Definition of the limit of a function. Basic properties of limits. Continuous functions and classification of discontinuities. Differentiability. Successive differentiation, Leibniz theorem. Maclaurin and Taylor series expansions. Asymptotes. Curvature. Test for concavity and convexity. Points of inflexion. Multiple points. Tracing of curves in cartesian and polar co-ordinates.

Integral Calculus:

Integration of irrational algebraic functions and transcendental functions. Reduction formulae. Definite integrals. Quadrature. Rectification. Volumes and surfaces of solids of revolution.

Reference books:

1. T.K.Manickavachagom Pillai, Calculus Volume – I (May 1992 Edition), Chapters I, III, VII, X (Section 2), XI
2. T.K.Manickavachagom Pillai, Calculus Volume – II (July 1992 Edition) Chapter I (Sections 8 to 14) and Chapter II.
3. Murray R Spiegel, Theory and Problems of Advanced Calculus, Schaum's Outline Series, Schaum Publishing Co., New York

Note: TEN questions are to be set and Three – Fifths of the paper carries full marks.

Semester – I

Paper – III **B113 NR**

BMG 103 - a VECTOR ANALYSIS AND GEOMETRY – I

Vector Analysis:

Scalar and vector product of three vectors.

Product of four vectors.

Reciprocal vectors.

Vector differentiation.

Gradient, divergence and curl.

Geometry:

General equation of second degree.

Tracing of conics.

System of conics.

Confocal conics.

Polar equation of a conic.

Reference books:

1. Durai Pandian, Vector Analysis (Relevant chapters)
2. T.K.Manickavachagom Pillai and T.Natarajan, Analytical Geometry of 2D - Part 1 Geometry : Conics and Polar Equation of a Conic (Relevant chapters)
3. Murray R.Spiegel, Theory and Problems of Advanced Calculus, Schaum Publishing Company. New York.
4. Murray R.Spiegal, Vector Analysis, Schaum Publishing Company, New York.

Note: TEN questions are to be set and Three – Fifths of the paper carries full marks.

Semester - II

Paper – IV **B121 NR**

BMG 101- b ALGEBRA AND TRIGONOMETRY – II

Mappings, equivalence relations and partitions. Congruence modulo n.

Definition of a group with examples and simple properties. Subgroups. Generation of groups. Cyclic groups. Coset decomposition. Lagrange's theorem and its consequences. Fermat's and Euler's theorems. Homomorphism and isomorphism. Normal sub groups. Quotient groups. The fundamental theorem of homomorphism. Permutation groups. Even and odd permutations. The alternating group A_n. Cayley's theorem. Introduction to rings, subrings, integral domains and field. Characteristic of a ring.

Logarithm of a complex quantity. Expansion of trigonometrical functions. Gregory's series. Summation of series.

Reference books:

1. I.N.Herstein, Topics in Algebra. Wiley Eastern Ltd, New Delhi, 1975.
2. S.Narayanan and T.K. Manicavachagom Pillai, Trigonometry, S.Viswanathan (Printers & Publishers) Pvt. Ltd, 1997.

Note: TEN questions are to be set and Three – Fifths of the paper carries full marks.

Semester – II

Paper – V **B122 NR**

BMG 102 - b CALCULUS –II

Ordinary Differential Equations:

Degree and order of a differential equation. Equations of first order and first degree. Equations in which the variables are separable. Homogeneous equations. Linear equations and equations reducible to the linear form. Exact differential equations. First order higher degree equations solvable for x, y, p. Clairaut's form and singular solutions. Geometrical meaning of a differential equation. Orthogonal trajectories. Linear differential equations with constant coefficients. Homogeneous linear ordinary differential equations.

Linear differential equations of second order. Transformation of the equation by changing the dependent variable / the independent variable. Method of variation of parameters.

Ordinary simultaneous differential equations.

Reference books:

1. T.K.Manickavachagom Pillai, Calculus Volume – II (July 1992 Edition), Chapters VIII, IX and X.
2. D.A.Murray, Introductory Course in Differential Equations, Orient Longman (India), 1967.

Note: TEN questions are to be set and Three – Fifths of the paper carries full marks.

Semester – II

Paper – VI **B123 NR**

BMG 103 - b VECTOR ANALYSIS AND GEOMETRY – II

Vector Analysis:

Vector integration.

Theorems of Gauss, Green and Stokes (Statements only) and problems based on these.

Beta and Gamma functions.

Geometry:

Plane.

The straight line and the plane.

Sphere.

Cone.

Cylinder.

Reference books:

1. T.K.Manickavachagom Pillai and T.Natarajan, A Text Book of Analytical Geometry - Part II- 3D Geometry, 2001 Edition.
   Chapters 2, 3, 4, 5 (Sections 1 to 8).

2. S.L.Loney, The Elements of Coordinate Geometry, Macmillan and Company, London.

Note: TEN questions are to be set and Three – Fifths of the paper carries full marks.

Semester - III

Paper - VII **B131 NR**

BMG 201 – a ADVANCED CALCULUS

1. Partial Differential Equations:

   1.1. Formation of equations by elimination of constants and arbitrary functions.
   1.2. Definitions of general, particular and complete solutions. Singular integral (Geometrical meanings not expected).
   1.3. Lagrange's method of solving the linear equation P p + Q q = R. (Geometrical interpretations not expected). Charpit's method.
   1.4. Partial differential equations of second and higher orders. Classifications of linear partial differential equations of second order. Homogeneous and non-homogeneous equations with constant coefficients.

2. Laplace Transforms:

   2.1. Definitions. Transform of 1, transform of the functions e^{-at}, cos at, sin at and t^n, where n is a positive integer, sinh at, cosh at.
   2.2. First shifting theorem: If the Laplace transform of a function f(t) is Ø(s), then the Laplace transform of e^{-at} f(t) is Ø(s+a),
   Laplace transforms of e^{-at} cos bt, e^{-at} sin bt, e^{-at} t^n.
   2.3. Second shifting theorem.
   2.4. Transforms of f '(t) and f ''(t).
   2.5. Inverse transforms relating to the above standard forms.
   2.6. Application to solution of ordinary differential equations with constant coefficients, involving the above transforms.

Text book:

T.K.Manickavachagom Pillai, Calculus, S.Viswanathan (Printers & Publishers) Pvt. Ltd. (Relevant portions).

3. Fourier Series:

   3.1. Definition – Finding Fourier coefficients for a given periodic function with period 2π. Odd and even functions. Half range series.

Text book:

M.K.Venkataraman, Engineering Mathematics (Relevant portions).

Note: 10 questions are to be set and 6 are to be answered. All questions carry equal marks.

Semester - III

Paper - VIII **B132 NR**

BMG 202 – a REAL ANALYSIS – I

1. Sets and Functions:

   Sets and elements – Operations on sets – Functions - Real valued functions – Equivalence – Countability – Real numbers – Least upper bound – Greatest lower bound.

2. Sequence of Real Numbers:

   Definition of sequence and subsequence – Limit of a sequence – Convergent sequence – Bounded sequence – Monotone sequence – Operation on convergent sequence - Limit superior and limit inferior – Cauchy sequence.

3. Series of Real Numbers:

   Convergence and divergence – Series with non-negative terms – Alternating series – Conditional convergence and absolute convergence – Rearrangement of series (statements only) – Tests for absolute convergence (statements only) - Series whose terms form a non-increasing sequence – Summation by parts.

4. Limits and Metric Spaces:

   Limit of a function on the real line - Metric spaces (Examples 4 and 5 under 4.2 c to be omitted) - Limits in metric spaces.

5. Continuous Functions on Metric Spaces:

   Functions continuous at a point on the real line – Reformulation – Functions continuous on a metric space – Open sets and closed sets - More about open sets – Connected sets.

Text book:

Treatment as in Richard R Goldberg, Methods of Real Analysis, Indian Edition, 1970.

Note: 10 questions are to be set and 6 are to be answered. All questions carry equal marks.

Semester - III

Paper - IX **B133 NR**

BMG 203 – a STATISTICS – I

1. Probability of an event - Probability space – Total probability - Conditional probability – Bayes theorem – Random variables – Discrete and continuous – Distribution function – Expected value and moments – Moment generating functions and characteristic functions – Tchebechev's inequality.

2. Binomial, Poisson, normal and uniform distribution - Concept of bivariate distribution - Marginal and conditional distributions.

3. Construction of univariate and bivariate frequency distributions - Diagrammatic and graphical representation of data and frequency distributions - only bar and pie diagrams and line diagrams - Frequency polygon - Frequency curve and histogram- Cumulative frequency distributions - Ogives and Lorenze curves - Measures of central tendency – Dispersion - Skewness and kurtosis for numerical data.

Text book:

S.C.Gupta and V.K.Kapoor, Fundamentals of Mathematical Statistics.

Note: 10 questions are to be set and 6 are to be answered. All questions carry equal marks.

Semester - IV

Paper - X **B141 NR**

BMG 201 – b THEORY OF NUMBERS, MULTIPLE INTEGRALS AND FOURIER TRANSFORM

1. Theory of Numbers:

   Prime and composite numbers - Resolution of a composite number into prime factors - Divisors of a given number N - Euler's function Ø(N) - Value of Ø(N) - Integral part of a real number - The highest power of a prime P contained in n! – Congruences - Fermat's theorem and Wilson's theorem.

   Text book:

   T. Natarajan and T.K.Manicavachagom Pillai, Algebra, S.Viswanathan (Printers & Publishers) Pvt. Ltd, Chennai (Relevant portions).

2. Multiple Integrals:

   2.1 Jacobian - Double and triple integrals - Evaluation in simple cases using Jacobians.
   2.2. Changing the order of integration- simple problems

   Text book:

   T.K.Manicavachagam Pillai, Calculus - Volume II, S.Viswanathan (Printers & Publishers) Pvt. Ltd, Chennai (Relevant portions)

3. Fourier Transform:

   Definition - Properties of Fourier transform - Linear property - Shifting property - Change of scale property - Modulation theorem - Fourier transform of integrals - Relation between Fourier and Laplace transforms - Convolution theorem for a Fourier transform - Parseval's identity - Fourier sine transform and Fourier cosine transform.

   Text book:

   M.K.Venkataraman, Engineering Mathematics (Relevant portions).

Note: 10 questions are to be set and 6 are to be answered. All questions carry equal marks.

Semester - IV

Paper - XI **B142 NR**

BMG 202 – b REAL ANALYSIS – II

1. Completeness and Compactness:

   Bounded sets and totally bounded sets - Complete metric spaces - Compact continuous functions on compact metric spaces - Continuity of the inverse function - Uniform continuity.

2. Calculus:

   Sets of measure zero - Definition of the Riemann integral - Existence of the Riemann integral - Properties of the Riemann integral – Derivatives - Rolle's theorem - The Law of the Mean - Fundamental theorem of Calculus - Improper integrals (continued).

3. The Elementary Function, Taylor Series:

   Hyperbolic function - The exponential function - The logarithmic function - Definition of x power a - The trigonometric function - Taylor function - The binomial theorem - L'Hopital's rule

Text book:

Treatment as in Richard R Goldberg, Methods of Real Analysis, Indian Edition, 1970.

Note: 10 questions are to be set and 6 are to be answered. All questions carry equal marks.

Semester - IV

Paper - IX **B143 NR**

BMG 203 – b STATISTICS – II

1. Correlation and regression analysis.

   (Sections 10.1 to 10.7 of Reference book No.1)

2. Theory of attributes.

   (Sections 11.1 to 11.8.2 of Reference book No.1)

3. Tests of significance - Standard error - Large sample tests - Exact test based on t, chi-square and F-distributions with regard to mean, variance and correlation coefficient - Test □f independence in congruency tables - Tests of goodness of fit - Test of hypothesis - Neymann Pearson theory - Concepts of most powerful test.

4. Analysis of variance:

   One way classification - Two way classification. (Sections A-5.4 to A-5.7 of Reference book No.2)

Reference books:

1. S.C.Gupta and V.K.Kapoor, Fundamentals of Mathematical Statistics.
2. S.C.Gupta, Statistics.
3. R.S.N.Pillai and V.Bagavathi, Statistics.

Note: 10 questions are to be set and 6 are to be answered. All questions carry equal marks.

Semester - V

Paper - XIII **B151NR**

BMG 301- a ABSTRACT ALGEBRA

1. Ring theory:

   Ring homomorphism - Ideals and quotient rings - More ideals and quotient rings.

2. Ring Theory continued:

   The field of quotients of an integral domain - Euclidean rings - A particular Euclidean ring - The domain of Gaussian integers.

3. Vector spaces:

   Basic concepts of vector spaces - Linear independence and bases - Dual spaces.

4. Inner product spaces:

   Definition of inner product - Inner product spaces - Cauchy Schwartz inequality - Orthogonal vectors - Orthogonal complements - Ortho normal sets and bases - Gram Schmidt orthogonalization process.

5. Linear Transformations:

   Definition of a linear transformation - The algebra of linear transformations - Characteristic roots and characteristic vectors.

   Text book:

   I.N.Herstein: Topics in Algebra, John Wiley & Sons, New York, 1999.

   Unit 1: Chapter 3: Sections 3.3 to 3.5
   Unit 2: Chapter 3: Sections 3.6 to 3.8
   Unit 3: Chapter 4: Sections 4.1 to 4.3
   Unit 4: Chapter 4: Section 4.4
   Unit 5: Chapter 6: Sections 6.1 to 6.2

Note: 10 questions are to be set, with two questions from each unit. A candidate has to answer any 6 questions. All questions carry equal marks.

Semester - V

Paper - XIV **B152 NR**

BMG 302 – a COMPLEX ANALYSIS – I

1. Complex numbers – Definitions - Algebraic properties - Cartesian co-ordinates - Triangular inequality - Polar co-ordinates - Powers and roots – Region in the complex plane - The point at infinity.

2. Analytic functions - Functions of a complex variable – Mapping – Limit - Theorems on limits – Continuity – Derivatives - Differentiation formula - Cauchy Riemann equations - Sufficient conditions.

3. Cauchy Riemann equations in polar form - Analytic functions - Hormonic functions.

4. Elementary functions - Exponential function - Trigonometric functions and their properties - Hyperbolic functions - Logarithmic function - Branches of log z - Further properties of logarithms - Complex exponents - Inverse trigonometric functions.

5. Mapping by elementary functions - The linear function 1/z - Linear fractional transformation - The function z^n - The function $z^{1/2}$ - The functions W = exp z, W = sin z, W = cos z - Successive transformation W= z + 1/z.

Text book:

R.V.Churchil, Complex Variables and Applications.

Unit 1: Chapter 1
Unit 2: Chapter 2 (Relevant portions)
Unit 3: Chapter 2 (Relevant portions)
Unit 4: Chapter 3
Unit 5: Chapter 4

Note: 10 questions are to be set, with two questions from each unit. A candidate has to answer any 6 questions. All questions carry equal marks.

Semester - V

Paper - XV **B153 NR**

BMG 303 - a MECHANICS I: STATICS

1. Forces:

   Definition of a force - Types of forces: gravity, tension, resistance, friction - Magnitude and direction of the resultant of forces on a particle - Equilibrium of a particle.

2. Equilibrium of a Particle:

   Equilibrium of a particle acted on by three forces - The triangle of forces - Necessary and sufficient conditions for the equilibrium of a particle under three forces - Lami's theorem - Necessary and sufficient condition for the equilibrium of a particle under a system of forces - Equilibrium of a particle on a rough inclined plane.

3. Forces on a Rigid Body:

   Equivalent systems of forces - Resultant of parallel forces - Couples - Resultant of several coplanar forces - Moment of the resultant force - Varignon's theorem - Couples in a plane or in parallel planes - Resultant of a couple and force.

4. Three coplanar forces on a rigid body - Equation of the line of action of the resultant - Equilibrium of the rigid body under three coplanar forces.

5. Hanging Strings:

   Equilibrium of a uniform homogeneous string - Sag - Suspension bridge.

Text book:

P.Duraipandian, Laxmi Duraipandian and Muthamizh Jayapragasam, Mechanics, S.Chand and Company Ltd, New Delhi, 1997.

Unit 1: Chapter 2
Unit 2: Chapter 6
Unit 3: Chapter 7 (up to Section 7.9)
Unit 4: Chapter 7, Sections 7.10 to 7.12
Unit 5: Chapter 11

Note: 10 questions are to be set, with two questions from each unit. A candidate has to answer any 6 questions. All questions carry equal marks.

Semester - V

Paper - XVI **B154 NR**

BMG 304 – a OPERATIONS RESEARCH – I

1. Linear programming problem – Graphical method - Simplex method.

2. Transportation problem.

3. Assignment problem – Travelling salesman problem.

4. Replacement problem – Replacement of items that deteriorate with time - Replacement of items that fail completely.

5. Network analysis – Basic concepts – Construction of network diagram – CPM – PERT.

Text book:

Kanti Swarup, P.K.Gupta and Man Mohan, Operations Research, 1991.

Unit 1: Chapter 2 – Sections 2.1 to 2.3 and Chapter 3 – Sections 3.1 to 3.3
Unit 2: Chapter 6 – Sections 6.1 to 6.8
Unit 3: Chapter 7 – Sections 7.1 to 7.4
Unit 4: Chapter 18 – Sections 18.1 to 18.3
Unit 5: Chapter 19 – Sections 19.2 to 19.4 and 19.6 to 19.7

Note: 10 questions are to be set, with two questions from each unit. A candidate has to answer any 6 questions. All questions carry equal marks.

Semester - V

Paper - XVII **B155 NR**

BMG 305 - a PROGRAMMING IN C

1. C language fundamentals - Character set - Identifiers and keywords - Data types - Declarations – Expressions - Statements and symbolic constants - Input- Output- The functions getchar, putchar, scanf, printf, gets, puts – Processor commands: include, define - Preparing and running a complete C program - Operators and expressions- arithmetic, unary, logical, bitwise, assignments and conditional operator - Library functions.

2. Control statements: while, do-while statements - Nested loops - If-else, switch, break, continue and go to statements - Comma operator - Arrays: defining and processing - multi dimensional arrays - Strings and operations on stirrings.

3. Functions - Defining and accessing - Passing arguments - Function prototypes – Recursion - Use of library functions - Storage classes: automatic, external and static variables.

4. Structure: Defining and processing - Passing structure to function – Union.

Pointers: Pointers and arrays - Pointer and string - Pointer and function.

5. Simple file operations: The pointer as a file - Low level file operations - Random access file operation.

Text book:

V.Rajaraman: Computer Programming in C, Prentice Hall of India, New Delhi.

Scheme of Examination:

Passing minimum: Theory: 30 marks out of 75.
Practical: 10 marks out of 25.

For the theory examination, 10 questions are to be set, with two questions from each unit. A candidate has to answer any 6 questions. All questions carry equal marks.

The practical examination to be conducted as an external examination by the University by appointing an examiner from the faculty of Mathematics department, involved in the teaching of the subject.

Semester - VI

Paper - XVIII **B161 NR**

BMG 301 - b DISCRETE MATHEMATICS

1. Mathematical Logic:

   Connectives – Well formed formulas – Tautology – Equivalence of formulas – Duality law – Tautological implications – Normal forms.

2. Algebraic Structures:

   Algebraic systems and their properties – Semigroups and monoids – Homomorphisms of semi groups and monoids – Subsemigroups and submonoids – Grammars and languages – Syntax analysis – Polish expressions and their compilation – Finite state machines.

Text book:

J.P.Trembley and R.Manohar, Discrete Mathematical Structures with Applications to Computer Science, Mc Graw Hill Book Company, 1997.

Chapters 3 and 4 (Sections 3.1, 3.2, 3.3, 3.4 and 4.6).

3. Graph Theory:

   Definition – Application of graphs – Finite and infinite graphs – Incidence and degree – Isolated vertex, pendent vertex and null graph – Isomorphism – Sub graphs.

4. Paths and Circuits:

   Walks, paths and circuits – Connected graphs, disconnected graphs and components – Euler graphs – Operations on graphs – More on Euler graphs - Hamiltonian paths and circuits.

5. Trees:

   Trees – Some properties of trees – Pendent vertices in a tree – Distance and centers in a tree – Rooted and binary trees – Counting trees - Spanning trees.

Text book:

Narasinga Deo: Graph Theory with Applications to Engineering and Computer Science, Prentice Hall of India Private Limited, New Delhi.

Relevant portions in Chapters 1, 2 and 3.

Note: 10 questions are to be set, with two questions from each unit. A candidate has to answer any 6 questions. All questions carry equal marks.

Semester - VI

Paper - XIX **B162 NR**

BMG 302 – b COMPLEX ANALYSIS – II

1. Integrals:

Definite integrals – Contours – Line integrals – Examples – The Cauchy Goursat's theorem – A preliminary lemma – Proof of Cauchy Goursat's theorem – Simply and multiply connected domains - Indefinite integrals.

2. The Cauchy integral formula - Derivatives of analytic functions - Morera's theorem - Maximum moduli of functions - The fundamental theorem of algebra.

3. Series:

Convergence of sequences and series - Taylor series - Observations and examples - Laurent series - Further properties of series.

4. Residues and Poles:

Singularities - Definitions and examples – Residues - The residue theorem - The principal part of a function – Poles - Quotient of analytic function.

5. Contour Integration:

Type – 1: $\int f(\sin \theta, \cos \theta)\, d\theta$

Type – 2: $\int f(x)\, dx$

Type – 3: $\int p(x)/q(x)(\cos(mx))\, dx$, $\int p(x)/q(x)(\sin(mx))\, dx$

Text book:

R.V.Churchil, Complex Variables and Applications.

Unit 1: Chapter 5 (Relevant portions)
Unit 2: Chapter 5 (Relevant portions)
Unit 3: Chapter 6
Unit 4: Chapter 7 (Relevant portions)
Unit 5: Chapter 7 (Relevant portions)

Note: 10 questions are to be set, with two questions from each unit. A candidate has to answer any 6 questions. All questions carry equal marks.

Semester - VI

Paper - XX **B163 NR**

BMG 303 - b MECHANICS – II: DYNAMICS

1. Kinematics:

   Velocity - Relative velocity – Acceleration - Angular velocity - Relative angular velocity - Rectilinear motion - Work, power and energy.

2. Central Orbit:

   Central forces and central orbit - Equations of a central orbit - Law of force and speed for a given orbit - Determination of the orbit when the law of force is given - Kepler's laws of planetary motion.

3. Motion of a Projectile under Gravity:

   Motion of a projectile - Nature of a trajectory - Results pertaining to the motion of a projectile - Maximum horizontal range - Trajectories with a given speed of projection and a given horizontal range - Speed of a projectile - Range of an inclined plane - Maximum range on the inclined plane - Envelope of the trajectories.

4. Simple Harmonic Motion and Moment of Inertia:

   Definition of simple harmonic motion - Composition of two simple harmonic motions of the same period.
   Moment of inertia - Theorems of moment of inertia - Theorem of perpendicular axes - Theorem of parallel axes.

5. Two Dimensional Motion of a Rigid Body:

   Two dimensional motion of a rigid body - Motion of a rigid body rotating about a fixed axis - Compound pendulum - Reaction of the axis on a rigid body revolving about a fixed axis - Equations of motion for a two dimensional motion - Motion of a uniform disk rolling down an inclined plane.

Text book:

P.Duraipandian, Laxmi Duraipandian and Muthamizh Jayapragasam, Mechanics, S.Chand and Company Ltd, New Delhi, 1997.
Unit 1: Chapters 1 and 4
Unit 2: Chapter 15
Unit 3: Chapter 13 (up to Section 13.9)
Unit 4: Chapter 5 (Sections 5.1 and 5.3 only) and Chapter 16
Unit 5: Chapter 17

Note: 10 questions are to be set, with two questions from each unit. A candidate has to answer any 6 questions. All questions carry equal marks.

Semester - VI

Paper - XXI **B164 NR**

BMG 304 – b OPERATIONS RESEARCH – II

1. Sequencing Problem:

   Problems with n jobs through 2 machines - Problems with n jobs through 3 machines - Problems with n jobs through m machines.

2. Dynamic Programming:

   Recursive approach – Computational procedure – Tabular method – Solution of LPP by dynamic programming.

3. Inventory Control:

   Deterministic Models:

(i) Uniform rate of demand, infinite rate of production, no shortages
(ii) Uniform rate of demand, finite rate of replenishment, no shortages
(iii) Uniform rate of demand, instantaneous production, with shortages
(iv) Uniform rate of demand, instantaneous production, with shortages and fixed time

4. Games and Strategies:

   Competitive games – Two person zero sum game – Maximin - Minimax principle – Saddle point – Solution using the principle of dominance - Graphical solution.

5. Simulation Technique:

   Introduction – Even type simulation – Generation of random phenomena – Monte Carlo technique - Simulation technique applied to inventory problems.

Text book:

Kanti Swarup, P.K.Gupta and Man Mohan, Operations Research, 1991.

Unit 1: Chapter 9 – Sections 9.1 to 9.6
Unit 2: Chapter 10 – Sections 10.1 to 10.5
Unit 3: Chapter 11 – Sections 11.2 to 11.5, 11.18
Unit 4: Relevant portions
Unit 5: Relevant portions

Note: 10 questions are to be set, with two questions from each unit. A candidate has to answer any 6 questions. All questions carry equal marks.

Semester - VI

Paper - XXII **B165 NR**

BMG 305 - b NUMERICAL ANALYSIS USING C

1. Numerical solution of algebraic and transcendental equations - Bolzono's bisection method - Successive approximation method – Regula falsi method – Newton-Raphson method - Numerical solution of simultaneous linear algebraic equations – Gauss elimination method - Gauss Jordan elimination method - Gauss Seidel iteration method.

2. Finite difference operator – Solution of first and second order linear difference equations with constant coefficients – Non-homogeneous linear difference equation with constant coefficients.

3. Interpolation - Newton-Gregory forward and backward interpolation – Newton's divided difference formula – Lagrange's interpolation formula for uneven intervals – Gauss interpolation formula - Numerical differentiation – Numerical integration – Trapezoidal rule – Simpson's $1/3^{rd}$ rule.

4. Numerical solution of ordinary differential equation of first and second order - Simultaneous equations – Taylor series method – Picard's method.

5. Euler's method – Improved Euler's method – Modified Euler's method – Runge-Kutta method of second and fourth order – Milne's predictor corrector method.

Text book:

M.K.Venkataraman, Numerical Methods in Science and Engineering, National Publishing Co, Chennai, 2001.

Unit 1: Chapters 3 and 4
Unit 2: Chapter 5
Unit 3: Chapters 6 and 9
Unit 4: Chapter 11 (Relevant portions)
Unit 5: Chapter 11 (Relevant portions)

Scheme of Examination:

Passing minimum: Theory: 30 marks out of 75.
Practical: 10 marks out of 25.

For the theory examination, 10 questions are to be set, with two questions from each unit. A candidate has to answer any 6 questions. All questions carry equal marks.

The practical examination to be conducted as an external examination by the University by appointing an examiner from the faculty of Mathematics department, involved in the teaching of the subject.